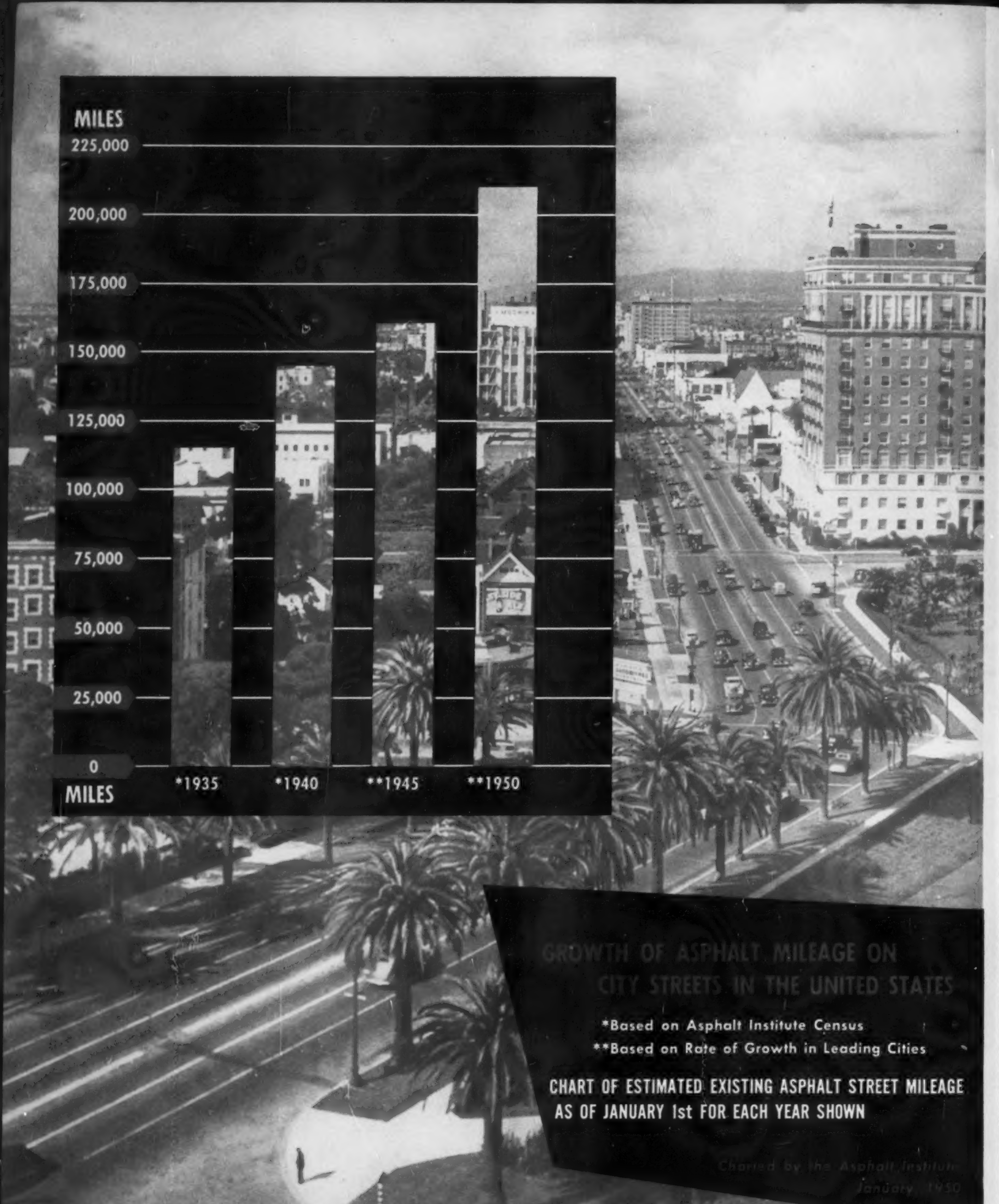
Asphalt Institute Quarterly

JANUARY 1950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MILES
*1935
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GROWTH OF ASPHALT MILEAGE ON
CITY STREETS IN THE UNITED STATES
*Based on Asphalt Institute Census
**Based on Rate of Growth in Leading Cities
CHART OF ESTIMATED EXISTING ASPHALT STREET MILEAGE
AS OF JANUARY 1st FOR EACH YEAR SHOWN
Charted by the Asphalt Institute
January, 1950

ASPHALT INSTITUTE *Quarterly*

VOL. 2 No. 1 JANUARY, 1950

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The names of the Member Companies of the Institute, who have made possible the publication of this magazine, are listed herein on page 15.

EDITORS

Bernard E. Gray, *President of The Asphalt Institute*
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Articles may be freely reprinted with credit line. Correspondence should be addressed to the Asphalt Institute Quarterly, 801 Second Avenue, New York 17, N. Y.

COVER

Featured on the front cover is New York City's asphalt-paved Roosevelt Drive along the East River, looking north toward the Queensboro Bridge. On the back cover, rising in the central background is the Secretariat Building, first of the group planned as permanent headquarters of the United Nations.

The graphic chart featured on the opposite page, surprinted over asphalt-paved Wilshire Boulevard in Los Angeles, illustrates how rapidly asphalt's use for city paving has increased during the past fifteen years. Asphaltic types now constitute over 85% of the paved city mileage.

EDITORIAL

City streets in the United States carry more vehicle miles of travel than all the highways outside of city limits combined. In 1948, setting a new motor vehicle travel record, such urban travel amounted to 203 billion miles, with rural travel totalling 197 billion. As most of this record urban and rural traffic used the 240,000 miles of paved city streets and the 1,540,000 miles of improved rural roads respectively, the ratio of *intensity* of traffic was approximately *seven* vehicle miles on a city pavement to *one* on a rural highway.

It is true that, in spite of this greater concentration of traffic on city streets, there are several saving factors so far as wear and tear are concerned. While even a residential street often may carry more automobiles and trucks than a busy state highway, speeds are much lower; and heavy-traffic streets usually have a paved curb and gutter. This, combined with an efficient storm sewer system, insures that the subgrade is maintained at above average support condition.

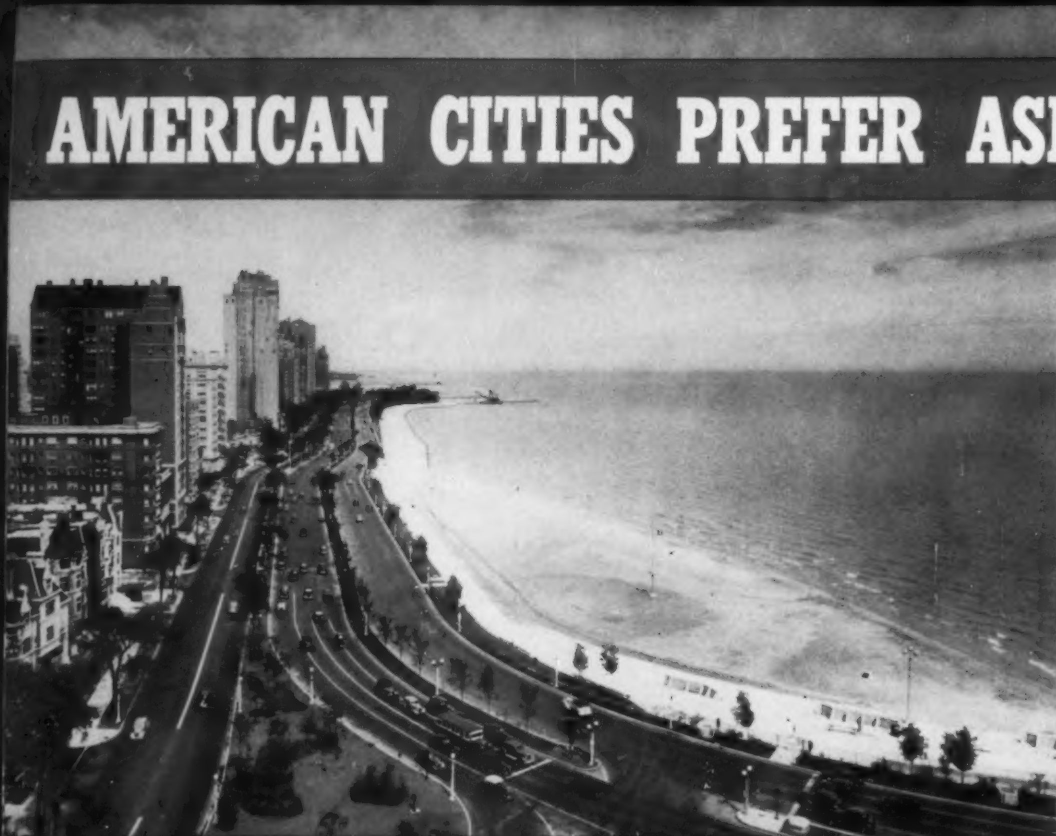
This preponderance of urban traffic has prevailed from the earliest times, and it was but natural that pavements should have been placed first on the principal thoroughfares of ancient cities. One of the earliest historical references (600 B.C.) in this regard concerns the processional streets of Babylon, which were constructed of brick bonded with asphalt. In modern times, asphalt streets first were built in European cities, in the mid-nineteenth century, followed soon after by similar paving in the United States, the first work being laid in Newark, New Jersey in 1870. Since that date their use has been extended to the smallest municipality, so that today over 85% of all paved city streets employ asphalt.

The City Engineer undoubtedly has more varied problems to solve than any other engineering administrator. With the accelerated growth of vehicle traffic, he is confronted, not only with the task of street construction and maintenance proper, but also with the problem of building off-street surfaces for parking. This in itself has become no small job, for the difficulties are both physical and psychological. The average motorist, who would never expect to obtain his office space free, nevertheless believes that he is entitled to occupy a room-size area just across the sidewalk for nothing. The congestion has become so great in the central areas of many cities that the only remedy may be complete denial of the streets therein to private passenger cars during the rush hours. Even in such an event, traffic use will continue so intense that the closing of a single street may constitute a real hazard. Methods of repair therefore must be devised which will keep such delays to a minimum.

There are many special items of design and construction that are peculiar to city streets, such as those necessitated by numerous traffic lights and bus stops which lead to a kind of pavement stress not found on the rural highways. This is particularly aggravated where trolley busses have been substituted for street cars, with unusually quick stopping and starting. Then of course there is the problem of repaving when street cars are abandoned. Should the tracks be torn out, or is it possible to pave over them and thus save both time and expense? Finally there is the all important matter of *maintenance*. With intense concentration of traffic, abrasive wear is rapid and consequently the technique to be followed in surface renewal calls for great skill both in planning and execution.

PHOTO: GALLOWAY

AMERICAN CITIES PREFER ASPHALT



CHICAGO — Looking north along busy Lake Shore Drive. Twelve lanes of asphalt pavement.

DETROIT — Six-lane, one-way traffic o

In view of the present day preponderance of asphalt pavements in American cities, and with increasing preference being shown for this material, it would seem appropriate to review briefly the history of their development, as an introduction to a general discussion of the problems involved in design, construction, and maintenance. It is a far cry indeed, from the rough noisy cobblestones of but a few generations ago to the smooth and quiet pavements now so generally in use. To be sure, there is only a change in kind, so far as total noise is concerned, for where once it was the clop-clop of steel-shod horses' hoofs plus the rumble of steel-rimmed wheels, there is the new note in the roar of the city, composed of a blend of raucous horns and the unmuffled thunder through thousands of exhaust pipes, as traffic piles on traffic in downtown city streets. One can only wonder, however, just how much worse it could have been if the pavements themselves, at least, had not been made more quiet.

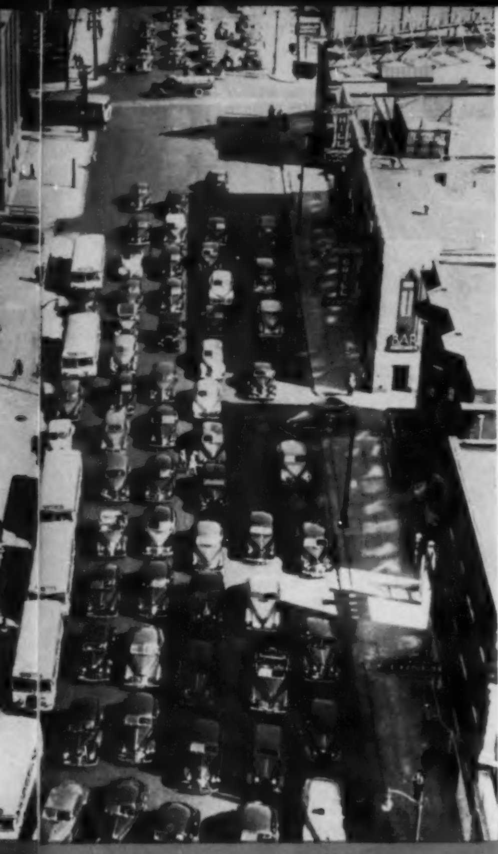
Moreover, as one reviews the developments which have occurred in this era of transition from horse-drawn traffic days to the completely motorized present, he cannot but be impressed with the fact that the fundamental requirements remain relatively unchanged. It is only the technique of doing the work that has been altered. For example, thousands of miles of old stone block pavements continue to serve as foundations under the new asphalt surfaces. Old brick and macadam have been salvaged in a similar manner. Their original load-supporting values are merely enhanced by being better preserved through waterproofing. Even the loads being applied to many city streets today are often less than when the huge drays pounded along with high impact from both hoof and solid wheel.

HISTORICAL BACKGROUND

It is perhaps strange that so many centuries elapsed between the first use of asphalt in the ancient city of Babylon and its re-discovery and wider uses within only the past one hundred years. The explanation lies probably in the shift of civilization centers from areas adjacent to those early supplies of asphalt to the newer developments in the more westerly areas. Rome built its roads and streets of massive stone, and extended the practice to the very farthermost limits of England itself. Such procedures continued down to the middle of the nineteenth century.

EARLY USE OF ROCK ASPHALT

The re-found use of asphalt for pavements came about almost in an accidental fashion. Certain rock asphalt mines in southern Europe were being operated with a view only to extraction of the mineral oils until someone



traffic on Asphalt-paved Second Avenue.
U.S. Bureau of Public Roads

observed that the fragments dropping from the two-wheel carts (as they were moved from the mine to the heating kettles) coalesced under the wheels to form a smooth pavement of high resilience, completely waterproof in character. It was then but a short time before this natural product was being used for special sections of boulevards in Paris, Brussels and other European cities, where the smooth surface and cleanliness made for fashionable driving of the rather magnificent horse-drawn equipages of that period. By 1870 this rock asphalt was being imported into the United States, hauled to some extent as ballast in the grain ships returning without cargoes from the continent.

LAKE ASPHALT IMPORTED

A few years later the exploitation of the so-called natural or lake asphalt from the Island of Trinidad, led to the design of a blended mixture of asphalt cement, fine and coarse aggregate which were mixed together in a plant and thereafter spread upon the street and compacted by rolling. These first designs were to some extent an attempt to duplicate the properties found in the best grades of rock asphalt and, by what subsequently proved to be a freak of fate, the available sands adjacent to New York City being naturally highly stable in character, thus made excellent fine-graded mixtures. As the use of this so-called sheet asphalt spread to other cities, it was at first thought that any sand having a gradation similar to that found in the mixed pavements of New York would be entirely satisfactory. This did not prove to be the case and so, after unsatisfactory work with a number of local sands, a further development in asphalt pavement design took place, by mixing coarser aggregates with the asphalt cement to produce what we now call asphaltic concrete.

ASPHALT REFINED FROM PETROLEUM

It is to be remembered that *all* asphalt comes from petroleum. The rock asphalts found in Europe, in the United States, and other parts of the world are simply instances of asphaltic base petroleums which are naturally dispersed through porous rock structures composed either of limestone or sandstone. When compressed and upheaved by geological changes, the lighter fractions were exposed to the atmosphere and evaporated, so that only the asphalt cement and mineral aggregate remained.

Lake asphalts, such as those from the famed Island of Trinidad and the almost equally well known Bermudez Lake, are merely two of many such deposits throughout the world where the petroleum escaped from its place of original deposition into a depression, so that over the centuries a sort of natural refining process took place whereby again the lighter fractions evaporated, leaving a heavy residual asphaltic material behind. When purified and blended with a petroleum flux, a suitable asphalt cement was obtained.

Today these earlier sources, while used to some extent, are insignificant in amount as compared with the volume derived directly from the refining of petroleum. Illustrating the relative importance of these several sources today, there were produced in 1948 approximately ten and one-half million tons of asphalt directly from petroleum refining and only a few hundred thousand tons of asphalt products from all of the lake asphalt and rock asphalt sources combined.

However, we owe a great deal to the early engineers and chemists, including H. C. Bowen, A. W. Dow and Clifford Richardson, who were employed by the Barber Asphalt Company, operating the Trinidad Lake concession. Mr. Richardson wrote a book entitled "The Modern Asphalt Pavement" (1905), and while there are some changes in present design procedures, many of the fundamental concepts there laid down are the guiding principles in current practice.

MODERN TECHNIQUES

Modern laboratory equipment, the splendid asphalt plants made possible today through the development of better steels, easier operations through use of electric power, further aided by mechanical spreading equipment in place of hand raking, are all most essential refinements because of their important effect in reduction of costs and faster construction, but the fundamental procedures resulting from the original researches are still controlling factors.

NEW YORK CITY'S FORTY-SECOND STREET — Newly completed widening, car-track removal and asphalt repaving.

CONSTRUCTION METHODS

Photo: Galloway

WASHINGTON, D. C. — Approach to National Capitol on asphalt-paved Pennsylvania Avenue.

In the short space here available, it is not possible to present a detailed description of design and construction procedures, but rather it is intended to draw attention to some of the important considerations involved.

City street surfaces may include the full range of types, from those designed for the heaviest traffic, to the simple surface treatments so widely used on many residential streets and in new real estate additions. As a matter of fact there are many miles, even today in the largest metropolitan areas, where traffic is carried over surfaces consisting merely of a thin layer of screenings, cinders, or gravel, which have been given only a dust-layer treatment. In this brief article, however, the only group covered will be the main arteries of travel which require strong pavements, and these will be divided into three categories, according to aggregates available in the area. They are asphaltic concrete, stone-filled sheet asphalt, and sheet asphalt, generally mixed in an off-street plant, so as to permit minimum interference with traffic and yet be of a nature that as soon as compacted may be used *immediately* for travel.

SKID-RESISTANCE AND STABILITY

Asphalt surfaces, properly constructed, are the most *skid-resistant* of all types of pavement, as has been so thoroughly proven by the studies of Professor R. A. Moyer at Iowa State College, and those of the Research Division of the Virginia State Highway Department under the direction of Messrs. Shelburne and Sheppe. These studies are in the Proceedings of the National Highway Research Board. Asphalt pavements may be constructed which have such *stability* also, as to carry the heaviest concentrated loads readily without deformation. These qualities, however, are not to be obtained by accident, or by hit-or-miss methods, in the belief that construction procedures are foolproof, any more than other engineering works can be carried on successfully by inexperienced people. Good asphalt pavements are obtained through having a combination of competent designing engineers, well-equipped contractors, and efficient field control of placement operations.

LABORATORY TESTING

Starting in the laboratory, all materials which will be incorporated in the final work first should be tested for quality, and then various trial mixtures should be made and measured for strength and durability until the appropriate job-mix formula has been determined. Both strength and durability of

an asphalt pavement depend largely upon two factors, stability and density. Stability often can be obtained merely by using enough coarse aggregate, but the mixture may be so open as to permit entry of water. Density of the pavement as finally compacted is very important. This quality thus involves determination of the percentage of voids in the mineral aggregate, and the largest amount of asphalt should be added consistent with securing the minimum stability requirement.

There is nothing new or complicated about determination of this job-mix formula. It should be carried on as a matter of routine procedure in the design of any concrete, whether employing an hydraulic or a bituminous cement. A trained, experienced asphalt chemist should always be responsible for the mix design. As may not be so well known, both sand and coarse aggregate, while apparently alike in respect to size, often may require different amounts of asphalt cement to produce the needed qualities in the mix, and hence only through trial mixtures can the best results be secured.

The particular strength required in pavements varies according to the character of traffic. Stop lights and bus stops, for example, lead to increased stress in pavements, and higher stabilities thus are needed to meet these heavier duty conditions. By adjusting proportions of mixtures, selecting particularly strong aggregates, or combinations of the two, the laboratory readily determines the mix that best serves the purpose.

PHILADELPHIA — Asphalt pavement on Benjamin Franklin Parkway, looking toward City Hall. *Photo: Lambert*

TULSA — Asphalt-paved Main Street, as resurfaced in 1949.

SEATTLE — Asphalt-paved intersection of Airport Way, Dearborn Street and Fifth Avenue.

ASPHALT PLANT

Once the desired qualities have been provided through appropriate laboratory studies, the next step is a study of the asphalt plant itself, so that a paving plant formula may be worked out, based upon the laboratory formula, which will insure the actual manufacture and placement of the mixture in accordance with the planned design. The assumption so often made that aggregates as received from the quarries and the pits remain constant in gradation is erroneous and, therefore, it is important that proper separation of the aggregates into the several bins should be accomplished prior to recombination. Screening of the aggregates, however, is not the end of the control, as even with the best equipment a certain amount of fine material is carried over with the successively coarser sizes. A study of this condition (which may vary from one source of aggregate to another), is therefore essential so that plant operation will make due allowance for the particular conditions, and the mix as it reaches the street will very closely approximate the proportions as determined originally in the laboratory.

FIELD INSPECTION

While the modern asphalt plant is an excellent piece of equipment, there is no substitute for competent field inspection, as the qualities of the raw materials do change from time to time, and it is necessary to exercise certain manual control. Very often stone screenings may be the key material and the variation of coarse to fine sizes may vary from one car to another. Occasional adjustment in respect to the carry-over to the several bins is needed to keep a steady flow of material through the plant, so that related size composition will remain uniform. The time of mixing is most important and, contrary to some impression, long mixing can be detrimental. Only the minimum time required to coat the particles thoroughly is necessary. This seldom exceeds sixty seconds and, with asphaltic concrete, may be less than forty-five seconds, including charging and discharging.

The mixing temperatures should be held at the lowest point consistent with coating and proper spreading and compaction on the street. With the almost universal employment of mechanical spreading equipment, temperatures today can be somewhat lower than those required when hand-raking was standard procedure. Specifications should be so modified that the lowest temperature, consistent with proper spreading and compaction, should apply. Obviously, this is affected by the air temperature at the time of placement. In warm weather, spreading temperatures of 225°F. may be entirely adequate for asphaltic concrete, and for sheet asphalt temperatures over 300°F. are seldom required. Too-high mix temperatures shorten the life of the pavement by hardening the asphalt cement unduly, while lack of temperature control leads to an irregular appearance in the completed work.

PAVEMENT THICKNESS

Asphalt wearing courses on city streets range usually from two to three inches in thickness, depending upon the composition of the mix. The foundation upon which this wearing course rests may be of a wide variety, including asphaltic concrete, hydraulic cement concrete, macadam (both asphalt penetration and water bound); old block types of pavement which are to be resurfaced. The earlier foundations composed of hydraulic cement concrete were lean mixtures, and service records prove that they have been the most satisfactory where the rigid type bases have been employed. There is no reason to have such mixtures richer than 1:3:6, while leaner proportions are satisfactory because they more nearly approach the flexible type of base. Macadam base courses are being increasingly used for city street foundations to secure not only the inherent advantages of flexible design, but also marked reduction in first cost and greater durability.

More complete details may be obtained by writing the nearest Institute office.

Asphalt resurfacing on Linwood Boulevard in Kansas City, Missouri.

RESURFACING PROBLEMS

Placing second course of resurfacing on Clarendon Drive in Dallas, Texas.

Resurfacing over street car tracks. Thoroughly compacted, no depressions come through.

Asphalt has a unique engineering property which is of great importance in resurfacing work. It is the ability of any new layer of asphaltic material to become welded to the one previously laid and to become *an integral part* of it. This fact has made stage construction with asphalt standard practice on city streets, as well as on rural roads. Thus, as traffic increases over the years, additional strength may be built into any pavement simply through placement of an additional layer of asphalt plant-mix properly spread and compacted. The additional strength imparted to the old pavement through placement of as little as two inches of new asphalt surface is very substantial, while uneven areas are eliminated and proper crown and profile are restored.

Then there is the *salvage* of old pavements of other types, such as portland cement, brick, granite block and even wood block. The important consideration always is careful conditioning of the old pavement before placement of the new asphalt surface. All too frequently such details are overlooked and hence emphasis is placed on this phase of the work. Asphalt patches which are too fat should be removed, and preformed asphalt joint material should be raked out to a depth of at least one inch, as otherwise it will extrude into the resurfacing. Joint material in brick and granite block, however, need not be disturbed. Depressions should be patched out using a dense fine-graded mixture such as sheet asphalt, after first priming with a quick-setting liquid asphalt product. This primer both waterproofs the old surface and insures good bond with the new asphalt patch. The entire surface then should be carefully cleaned and the unpatched areas also primed with liquid asphaltic material.

A levelling course then should be spread over the entire street to the minimum depth that will insure the desired cross section, and finally the wearing course placed and compacted. Following these details will insure:

1. That no moisture will come between the new surfacing and the old base.
2. That there will be no reflection of old bituminous material through to the surface of the new.
3. That a uniform cross-section will be achieved, which will not settle subsequently under traffic.

ABANDONED CAR TRACKS

Resurfacing of streets on which car tracks are located has introduced some minor variables from the usual procedure. The question frequently is asked whether to pave directly over the tracks or to remove them prior to resurfacing. Each situation must be handled according to local needs, but there is no doubt that placement of a uniform pavement from curb to curb immediately increases the street capacity. This was borne out in striking fashion recently in New York City where Forty-second Street was repaved with asphalt following the removal of a double street car track. In this instance, as complete rehabilitation of underground facilities was also necessary, the entire track structure was removed and an entirely new pavement placed.

In the majority of instances, however, it is possible to place the new asphalt surface directly over the existing street car tracks. Because the track section usually is flat there will be sufficient depth of surfacing, when constructed to the new crown, to prevent any settlement over the track structure. It is beneficial, however, to fill the rail flanges with an asphalt patching mixture some time in advance of paving to permit thorough consolidation. Similarly, it is often the practice to place the levelling course also, over the old tracks and permit further traffic before completion of the work.

ASPHALT IN LEADING CITIES

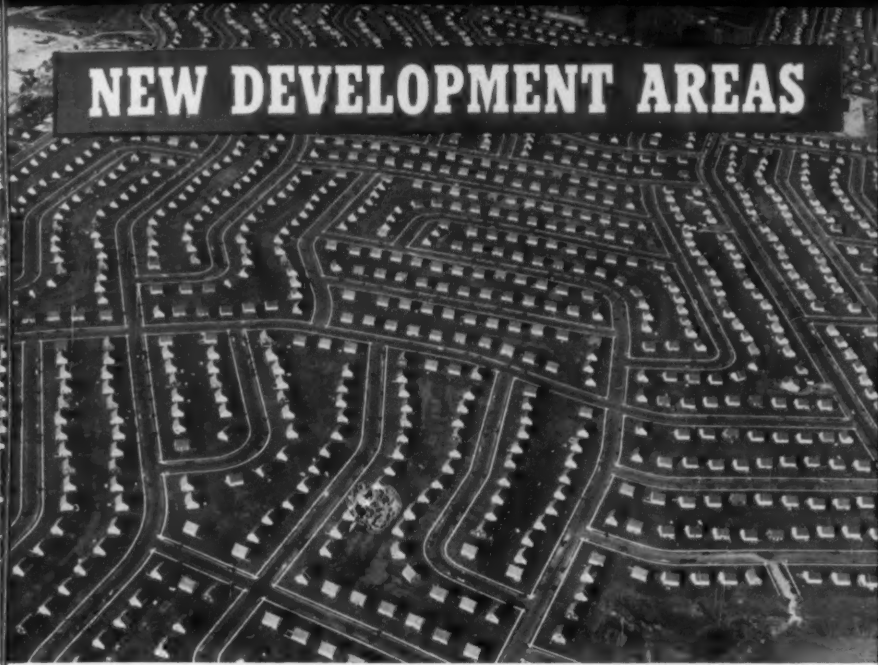
CLEVELAND — OHIO

ST. LOUIS — MISSOURI

BOSTON—MASS.

SAN FRANCISCO—CALIF.

NEW DEVELOPMENT AREAS



MORE THAN ONE HUNDRED MILES OF ASPHALT PAVING, thirty feet wide, have been built during the past three years in this fast-growing suburb of New York City.
(Photo of Levittown, Long Island, by Fairchild Aerial Surveys, Inc.)

One of the problems continually arising in city work is with regard to streets in new real estate developments. The situation presents itself usually in one of two classifications. In one, the area to be developed lies within the city limits, where municipal ordinances and specifications usually set forth the minimum acceptable standards. In the other, the development is adjacent to the city but outside its limits, where the only restrictions are those imposed by the developer himself, which often are calculated to be procedures wherein cost is the only consideration.

The City Engineer, however, is concerned in both instances, because he will be called upon to maintain both developments, sooner or later. Everywhere city limits are being extended to take in these newly-developed areas and, with the steady trend to greater concentration of population in cities, this will become an accelerated condition.

Accordingly, every effort should be made to insure a durable street structure; one which will meet not only the requirements of minimum first cost but of long life as well. Both of these conditions can be met by following the fundamental precept that when a good, well drained foundation is secured, any subsequent increase in traffic can be provided for through *stage construction.*

PRACTICAL DESIGNS

One of the most practical designs in areas where crushed stone is readily available, is a combination macadam foundation and an asphalt penetration macadam wearing course. This is particularly desirable where an entirely new development of large area is being carried on and where, even with the best of preparations, some subsequent settlement may occur. While the macadam surface may settle in small areas here and there, it will do so without breaking, and there will be a minimum requirement for maintenance. In areas where crushed stone is not available but where suitable fine aggregates are present, flexible bases composed of gravel or selected soil may be used with a surface of asphalt plant-mix. When using either the asphalt penetration macadam or plant-mix, the thickness of these surfaces should be not much less than $2\frac{1}{2}$ inches. Construction of this kind will afford satisfactory service for many years, with maintenance requirements consisting almost solely of a light seal coat at periodic intervals.

A recent inspection of a number of the surfaces carrying heavy traffic in suburbs adjacent to New York City, as well as a number in the Southeast, indicates that combination macadam bases and penetration wearing courses, now *thirty years* of age

LOW-COST STAGE CONSTRUCTION [illegible] in Denver. A good, well-drained foundation, paved with $1\frac{1}{2}$" thick mixed-in-place asphalt mat. Curb and heavier wearing surface can be added later, as needed.

HEAVIER DUTY PAVEMENT. A 4" crushed stone base, surfaced with 2" asphaltic concrete, on a city housing project in Minneapolis.

and more, are in substantially the same condition as when first constructed, and thus would appear to have unlimited life. Similarly on the West Coast, both hot-laid and warm-laid plant-mix surfaces have an excellent and long service history.

The important consideration in such construction is to have competent engineering supervision of the original street layout so that suitable gradients are secured, both of the street surface and of the underground drainage system. Whether or not curbs are installed with the initial construction makes but little difference, so long as the foundation material is of a character but little affected by frost or moisture, and is thoroughly compacted. In later years, such structures can serve for heavier asphalt pavements when and if required, and the entire first expenditure thus will be salvaged with minimum further cost to the taxpayer.

STREET MAINTENANCE

SPEED IN BALTIMORE. *(At left).* **Placing asphalt binder course.** *(At right).* **Old surface, with tack coat of emulsified asphalt.**

Completed pavement under week-day traffic.

The maintenance of city streets constitutes one of the principal jobs of the city engineer and, as in construction, varies all the way from heavy-duty hot-mix pavements to simple surface treatments in the outlying undeveloped areas. It is difficult to draw a line between resurfacing and maintenance because, in a number of cities, maintenance may involve a system of continuous resurfacing so that the pavement is held always at substantially its original thickness. This is particularly true where streets are maintained by the surface-heater method.

In reviewing the history of street repair in all parts of the country, it will be found that maintenance procedures fall roughly into four groups.

1. The so-called cut-out and replacement patch method.
2. The surface-heater repair method.
3. Complete removal and replacement of the entire wearing course.
4. Surface treatment.

As a matter of practical operation, almost every large city uses a combination of all four methods, the remaining few employing the surface-heater method almost exclusively.

1. PATCHING METHOD

The cut-out and replacement patch method is necessitated largely by reason of repairs to sub-surface utilities. In some cities, two different types of mixtures are used for replacement of the surface. To provide a temporary surface which can be used until more durable pavement can be restored, a cold-laid mix is placed immediately after the excavation has been backfilled. This is particularly necessary during cold weather, when full compaction of the sub-grade is not possible. The restoration, however, should be made with the *same type of mixture* employed in the original pavement. In a short period, the patch and the old surface will then blend so that a uniform appearance is maintained. Unfortunately in far too many cases, the new patch is made with so little regard to the color and texture of the old that, at the best, while the patch may be durable the resulting appearance is most unsatisfactory. At the worst, however, the patch if made with an open graded mixture, may not only look poorly but actually permit entry of water to the subgrade, with subsequent distortion.

2. SURFACE-HEATER METHOD

The surface-heater method is used very successfully by a number of cities and, where the work is carefully directed, has the advantage of maintaining the streets always in substantially their original condition. No two streets wear evenly. In fact, no two sections of a single street tend to have a uniform rate of wear. The peculiarities of traffic in relation to turning, even the differences involved in removal of ice and snow, may cause more wear on one block than on another. The surface-heater method permits renewal of these areas receiving accelerated wear in just the required amount, without disturbing the rest of the street. The process is better adapted to sheet asphalt and fine-graded asphaltic concrete than it is to coarse-graded mixtures because of the greater ease in feather-edging and blending of new and old area of pavement. Most sheet asphalt streets are constructed to a depth of three inches, of which the upper $1\frac{1}{2}''$ is the sheet mixture. After the street shows wear of as much as $\frac{1}{2}''$, surface heating and replacement of less than an inch of new asphalt mixture will completely restore the street

NEWARK — NEW JERSEY

ROCHESTER — N. Y.

DENVER — COLO.

COLUMBUS — OHIO

[illegible]

Resurfacing, in Tacoma, after heater-planer operation.

to its original condition, not only as to thickness, but also with respect to proper contour. This is particularly useful where there have been numerous service cuts.

3. NEW WEARING COURSE

Maintenance which involves complete replacement of the street surface means substantially a new pavement and requires little further comment so far as construction technique is concerned. There is, however, a new development in respect to the time element, and that is rapid execution of the work on Sundays, when the traffic is at a minimum. A number of cities are following this procedure but one will illustrate what can be accomplished in the way of minimizing inconvenience to traffic.

On Sunday, October 16, 1949, the City of Baltimore paved fourteen blocks of a downtown street *in one day,* between morning and evening. Seven contractors, each having his own asphalt plant, did the work, using eighty-three trucks, nine mechanical asphalt spreaders, and fourteen rollers. Approximately two hundred and fifty laborers, plus superintendents and foremen, provided the needed manpower. Twenty-five thousand square yards were completed between 5:30 in the morning and 9:30 at night. The asphalt surface replaced had been in use for over twenty-five years and the current volume of traffic is at the rate of eighteen thousand vehicles daily. The old foundation had settled in a number of areas and levelling courses of binder were placed to correct these inequalities. These varied from one inch to as much as three inches in depth. Some five hundred manholes had been readjusted during the preceding two-week period so that, as the day ended, an entirely new street of proper cross-section had been completed. This sort of planning commends itself to the general public and of course is an actual money-saving proposition, when all factors are considered.

4. SURFACE TREATMENT

There is one other principal situation which all cities have faced during the war period, which will continue for several years to come, viz.: — the need for carrying old pavements beyond the ordinary date for renewal. This situation was particularly the case in Detroit, where exceptional concentration of industrial production was required, with continuous twenty-four hour use of the streets. Out of sheer necessity, the city authorities developed two principal methods for surface treatment maintenance of old asphalt streets. The first consisted of a distributor surface treatment, using either asphalt cement or high viscosity asphalt emulsion, covered with a pre-coated sand. Very careful control of such work is necessary, where traffic is running at many thousands daily, but the results were surprisingly good, the old cracked surface being so improved as to stop further deterioration and to give an indicated additional life of the pavement of at least four years. Following experience with this procedure, a second and somewhat more substantial method was developed consisting of a thin surface treatment using a special plant-mix placed over a prime coat of emulsified asphalt. With this treatment, approximately one-half inch thick, it is estimated that a pavement life of an added eight to ten years has been obtained.

It is suggested that, in many cities where considerable lighter traffic is had, one or the other of these methods may be employed, so extending the useful life of existing asphalt pavements many years beyond that previously thought practicable.

ADVANTAGES FOR CITIES

ASPHALT STREETS TAKE LESS OF THE "TAX DOLLAR"

Greater Saving Features Include:

a. A comparatively low first cost.
b. A lower annual charge for interest and maintenance.
c. A longer life, free from abrasive wear.
d. A greater salvage value in making further improvements.

ASPHALT STREETS WIN GREATER PUBLIC APPROVAL

Greater Comfort Features Include:

a. A more resilient surface, blanketing vibration.
b. A joint-free surface, affording smoother riding.
c. A pleasing texture and dark color, assuring freedom from annoying glare.
d. A quickly constructed pavement, involving less detouring of traffic and loss to adjacent business.
e. A readily repaved pavement, permitting the frequent service cuts required in cities.

ASPHALT IN LEADING CITIES

ATLANTA — GEORGIA

FORT WORTH — TEXAS

SALT LAKE CITY — UTAH

QUEBEC — CANADA

ASPHALT PAVEMENTS FOR PARKING AREAS

Most City Engineers, confronted by the increasingly complex problem of traffic congestion, are finding that there can be no satisfactory solution without the construction of off-street parking areas. They are finding also that, for satisfactory service, mudless and dustless, the real economy lies in surfacing these parking areas with *asphalt*.

The first step in solving this parking phase of traffic congestion has generally been the use of *parking meters* along important streets. Over a thousand cities large and small, more than 50% of all cities having populations in excess of 5000, have made such installations.

A second step in many cities is the construction of off-street parking areas with the *revenue* obtained from parking meters. This trend is developing rapidly as meter revenue is considerable, having exceeded $100,000 in each of 26 cities in 1948. To date, more than 300 cities in nearly half the forty-eight states, having secured legislative permission, own and operate *municipal* parking lots.

Most parking lots, however, are *privately* owned and operated. Each year thousands of commercial enterprises establish their own and, to construct them, paving contractors experienced in asphalt surfacing work are widely available.

CONSTRUCTION DESIGN

Asphalt parking areas may be designed to meet any particular set of conditions whether for the lightest passenger car or the heaviest truck and trailer. Such areas consist of an asphaltic surface course placed either upon natural high support soils or upon a foundation of stone, gravel, slag, or other suitable aggregate that will improve the bearing value of poor soils.

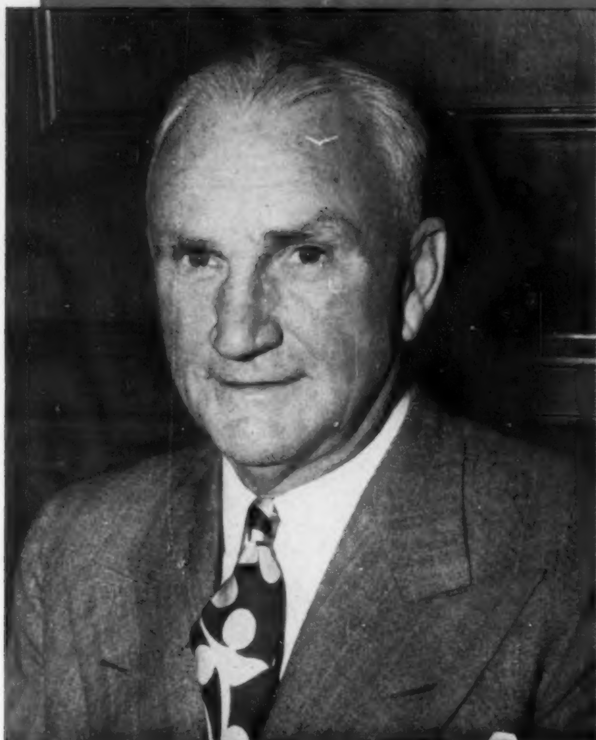
The Asphalt Institute booklet, "Asphalt Pavement for Parking Areas," pictured below, prepared to meet the rapidly-growing demand for many asphaltic paving types for these areas, recommends appropriate construction procedures. Its technical engineering text includes sections relating to Design Considerations, Maintenance, and Construction Specifications. Thicknesses required for different duty conditions are illustrated by typical cross-sections and supporting tables.

These designs have been prepared so that one or more of them will satisfy the local conditions not only with respect to durability but also with respect to utilizing contractors and contractor equipment available. In nearly every community there is a contractor experienced in one or more varieties of asphalt surfacing work. Ordinary excavation and filling, together with base course construction, can be done by any general contractor. Information concerning the availability of asphalt contractors can be readily obtained by calling one of the offices of The Asphalt Institute.

This 20-page booklet contains technical engineering text on the construction and maintenance of asphalt pavements for parking areas, and half-tone illustrations showing a wide variety of uses. A sample "Bidding Form and Contract" is included.

A copy of "Asphalt Pavements for Parking Areas" is available at the production cost of 25c. Remittance may be made to any Institute Office, as listed on page 15.

ASPHALT INSTITUTE PERSONALITIES



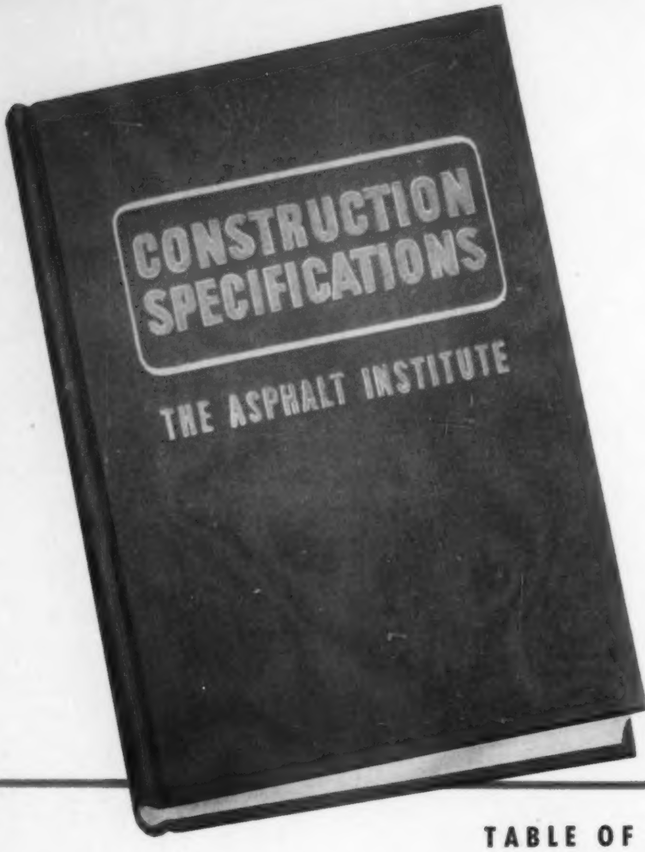
INGHRAM GRAYSON
Chairman of Executive Committee

BERNARD E. GRAY
President of the Asphalt Institute

Inghram Grayson has been elected to serve as Chairman of the Executive Committee of the Asphalt Institute for 1950. In accordance with Institute practice, a representative from a member company in another division will hold this office in 1951. As a Vice President, Mr. Grayson headed the Management Committee of the Mid-West Division of the Institute in 1947. He has spent twenty-one years with the Lion Oil Company, El Dorado, Arkansas, seventeen of them in the Asphalt Department. Since 1936 he has held his present position of Manager of Asphalt Sales for that Company.

Bernard Gray has been elected full-time President, effective January 1st, to direct all engineering, research, and publishing activities of the Asphalt Institute. Successively since 1930, following his earlier career as Resident Engineer in Massachusetts, Engineer-Economist and Senior Highway Engineer for the U. S. Bureau of Public Roads, and State Maintenance Engineer for West Virginia, Mr. Gray has held the Institute positions of Highway Engineer, Chief Engineer and his recent post of General Manager-Chief Engineer.

(A more detailed biography appeared in the July 1949 issue of the Quarterly at page 13.)



CONSTRUCTION SPECIFICATIONS of the Asphalt Institute, complete in one volume as pictured here (with contents listed below), are widely used by City Engineers, as well as by those in Federal, State and County jurisdictions. They are designed to provide broad, *general* standards of acceptable methods and materials for assuring completely satisfactory construction results. They are not intended for specific jobs, but to serve as guides in developing more detailed specifications having narrower limits of tolerance than is desirable in *general specifications.*

Within these limits engineers, public officials, and others engaged in road, street, and airport work may obtain full details as to design, construction procedure and maintenance from *Asphalt Institute Offices.* See list of addresses on opposite page.

A copy of "Construction Specifications" is available at the production cost of $1.00. Write, with remittance, to any institute office.

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